TIER 2

UNDERGROUND INJECTION CONTROL
PERMIT APPLICATION

Ute Tribal # 10-03
600' FNL & 1650 FWL
Sec. 10, T5S-R3W
Duchesne County, Utah
API # 43-013-31187

July 2015

Prepared for:
Bruce Suchomel
Groundwater Program, Mail Code 8P-W-UIC
U.S. Environmental Protection Agency
1595 Wynkoop St
Denver, CO 80202-1129

Prepared by:
Petroglyph Energy, INC.
960 Broadway Avenue, Suite 500, P.O. Box 70019
Boise, Idaho 83707
(208) 685-7600
FAX (208) 685-7605

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PERMIT APPLICATION

- CBL in microseconds not mVolts. How to quantify CBL
- NO CBL for AOR well
- USDW source?
- Sundry types

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LIST OF ATTACHMENTS

SUMMARY DOCUMENT
UIC WELL APPLICATION
Ute Tribal 10-03
API # 43-013-31187

The following document contains information provided in support of the application for the conversion of the Ute Tribal 10-03 well to an injection well in the Green River formation in the Antelope Creek Field in Duchesne County, Utah.

The Antelope Creek Field falls within the Uintah and Ouray Indian reservations and is within Indian Country; therefore, for facilities located on the reservation, only EPA-issued UIC permits are necessary for compliance with UIC regulations.

The EPA has issued an Area Permit #UT20736-00000 for the Underground Injection Control for the Antelope Creek Field. This area permit allows for additional producing wells to be converted to injection wells for enhanced recovery.

(1) Petroglyph Energy, Inc. (Petroglyph) is the operator and only working interest owner of wells located in the Antelope creek Field, Duchesne County, Utah. Petroglyph's business address is provided below:

Petroglyph Energy, Inc.
960 Broadway Avenue, Suite 500
P.O. Box 70019
Boise, ID 83707

(2) Enclosed as Attachment No. 1 is a topographic map of a portion of the Antelope Creek Field, identifying all wells located in this area. The legal location for the Ute Tribal 10-03 is 600' FNL & 1650 FWL NE/NW Sec. 10, T5S-R3W.

(3) Attachment No. 2 is a map of the well. This map shows a circle with a ¼ mile radius centered on the Ute Tribal 10-03 well. The ¼ mile radius encompasses the area of review, AOR, within which Petroglyph is required to investigate all wells for mechanical integrity. The ¼ mile radius also identifies mineral ownership; all lands within the AOR are leased to Petroglyph by the Ute Tribe as indicated by yellow shading. The AOR has Ute Tribal 10-04 well(s) located in its ¼ mile radius.

(4) Petroglyph proposes to utilize the Ute Tribal 10-03 as an injection well for enhanced recovery in the Antelope Creek Field.

(5) Injection Zone – The injection intervals are between 4106' and 6084' True Vertical Depth and located in the lower portion of the Green River Formation. The injection zone is confined within a 1978' section between the Green River "A" Lime marker bed and the top of the Basal Carbonate in the lower part of the formation. The injection zone is composed of lenticular calcareous sandstones interbedded with low permeable carbonates and calcareous shales. The lenticular sandstones vary in thickness from 1 to 30 feet.

Confining Zone – The overall confining strata above the injection zone consists of impermeable Green River calcareous shales and continuous beds of microcrystalline dolostone. The confining zone in the Ute Tribal 10-03 is 237 feet thick.

Attachment No. 3 is a structure map of the A-Marker surface.

Attachment No. 4 is a cross-section of the injection interval and confining zone.

(6) Enclosed as Attachment No. 5 are standard analyses of produced water from three batteries that currently serve as central handling facilities for all project producing wells. The analysis of the Green River formation water from the Ute Tribal 18-08 Satellite Battery is 12805 mg/L of total dissolved solids (TDS), Ute Tribal 21-11 Satellite Battery is 15659 mg/L TDS, and Ute Tribal 34-12-D3 Satellite Battery is 14590 mg/L TDS.

Injectate in the field is a mixture of produced water and fresh make-up water. The nearest injection well is the Ute Tribal 03-14, the most recent analysis of the water being injected into the Green River formation at this location is 6393 mg/L TDS. This analysis is also included in Attachment No. 5.

(7) A summary of completion data from the Ute Tribal 10-03 and offset wells in the AOR are included in Attachment No. 6

(8) The cement bond log is included in Attachment No. 7.

(9) The open hole log for the Ute Tribal 10-03 is included in Attachment No. 8.

(10) The Antelope Creek Field is operated under a Cooperative Plan of Development between the Ute Tribe and Petroglyph Energy. At the Ute Tribal 10-03 location, all mineral owners, surface owners and operators located within the AOR ¼ mile radius have been notified of the submitted EPA application to convert to injection. Attachment No. 9 is the Affidavit of Notification to all owners.

(11) Petroglyph requests a maximum surface injection pressure of **1900**psi. The EPA Area Permit No. UT20736-00000 uses the formula:

Pm = (0.88psi/ft - 0.43psi/ft(Sg)) D

Where:
Pm = Maximum surface injection pressure
0.88psi/ft = Fracture gradient
D = Top perforation depth
0.43psi/ft = Hydrostatic pressure/hydraulic head
Sg = Specific gravity of injection fluid

For the Ute Tribal 10-03:
1914psi = (0.88psi/ft - 0.43(1.00)) 4253ft

EPA Area Permit No. 20736-00000 further caps maximum surface pressure at 1900psi.

(12) Three wellbore diagrams for the Ute Tribal 10-03 are in Attachment No. 10. One diagram is for production, one for injection, and one for Plug & Abandonment (P&A).

(13) The P&A procedure for this well is shown in Attachment No. 11.

(14) Once the draft permit is issued, Petroglyph will conduct a Mechanical Integrity Test and a static bottom-hole pressure test. The MIT procedure is contained in Attachment No. 12. The conversion work will be satisfactorily completed and submitted to the EPA on Form 7520-12. A wellbore schematic will be included with this form.

(15) Petroglyph will give proof of financial responsibility by posting a surety bond for the UIC well prior to final permit approval. A copy of this letter is contained in Attachment No. 13.

(16) Petroglyph will install various gauges on the well so that the injection pressure and tubing/casing annulus pressure can be monitored. The well will be equipped with a flow meter with a cumulative volume recorder.

Ute Tribal 10-03 Well History

Well History:

Spud Well: 6/9/1987

Completed: 7/28/1987

First Production: 8/1/1987

Tops (KB):

BMSW* Found at 973'

Green River 1454'

A Marker 4106'

X Marker 4599'

Douglas Creek 4748'

B Limestone 5148'

Castle Peak 5624'

Basal Carbonate 6084'

Perf History

7/21/1987

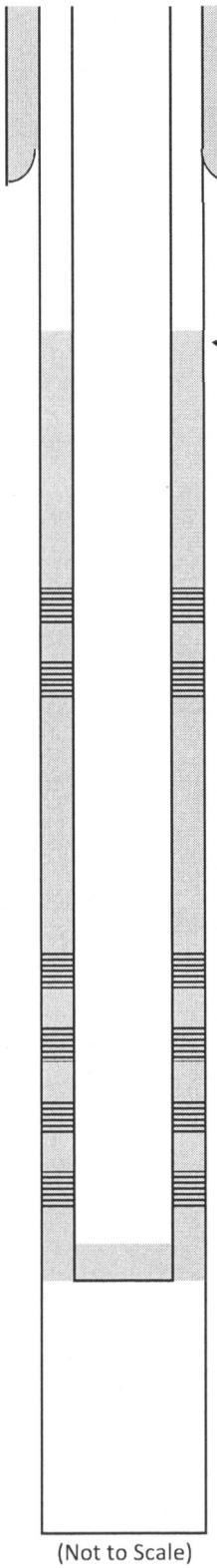
C09.1	5069' to 5078'
C09.2	5089' to 5103'

9/13/1990

B05	4253' to 4260'
B05	4266' to 4273'
B06	4295' to 4301'
B06	4316' to 4322'

5/16/2012

B06	4307' to 4310'
B11.1	4533' to 4543'
C03.1	4699' to 4704'
C06	4950' to 4957'
C09.2	5089' to 5103'
D3	5260' to 5267'



GL: 5963'

KB: 5973'

8 5/8" 24# Surface CSG @ 403' KB

cmt'd w/250 sx

Surface Hole size 12 1/4"

Cement top @ 2600'

5 1/2" 15.5# J-55 CSG @ 5631'

cmt'd w/1300 sx

Hole Size 7 7/8" bit

Perf's:

B05 4253' to 4260'

B05 4266' to 4273'

B06 4295' to 4301'

B06 4307' to 4310'

B06 4316' to 4322'

B11 4533' to 4543'

C03.1 4699' to 4704'

C06 4950' to 4957'

C09.1 5069' to 5078'

C09.2 5089' to 5103'

D3 5260' to 5267'

PBTD @ 5562' KB

TD @ 6770' KB

(Not to Scale)

Petroglyph Operating Co., Inc.

Ute Tribal #10-03

(600' FNL & 1650' FWL)

NE NW Section 10, 5S- 3W

Antelope Creek Field

Duchesne Co. Utah

API#: 43013311870000

*Plate 1 Utah Geological Survey Special Study 144. (2012). *BMSW Elevation Contour Map, Uinta Basin, Utah.* [map]. (CA 1:200,000)

Ute Tribal 10-03 Injection

Well History:

Spud Well: 6/9/1987

Completed: 7/28/1987

First Production: 8/1/1987

Tops (KB):

BMSW* Found at 973'

Green River 1454'

A Marker 4106'

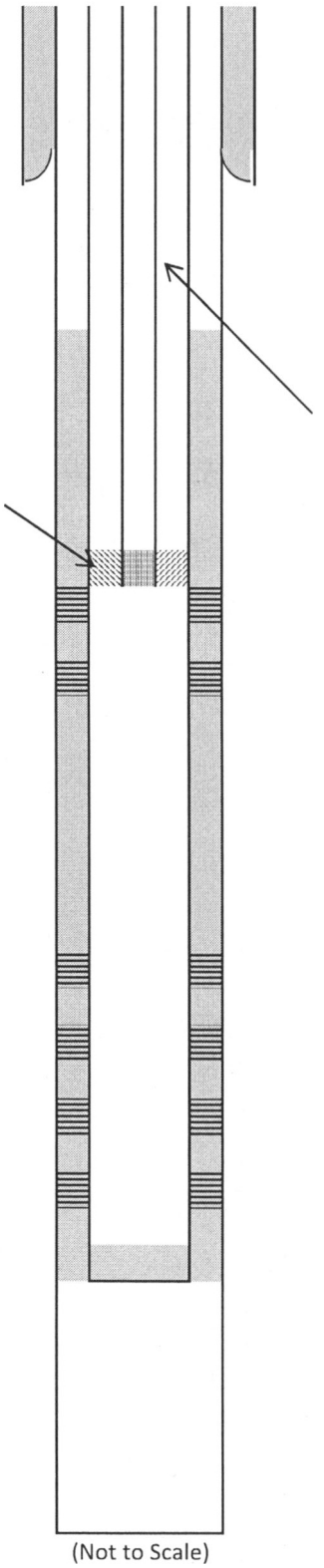
X Marker 4599'

Douglas Creek 4748'

B Limestone 5148'

Castle Peak 5624'

Basal Carbonate 6084'



(Not to Scale)

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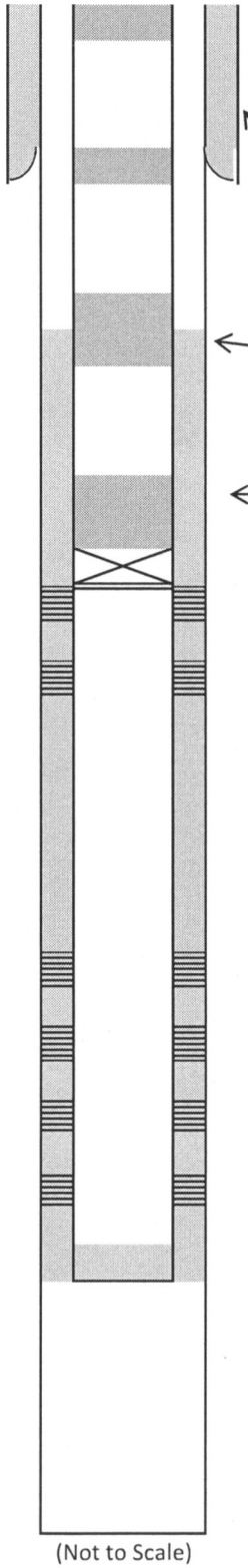
Ute Tribal 10-03 Plug and Abandonment



8sx Class G Cement-50' plug

15sx Class G Cement-100' plug

30sx Class G Cement-200' plug

30sx Class G Cement-200' plug

CIBP @ 4163'

GL: 6963'

KB: 5973'

8 5/8" 24# Surface CSG @ 403' KB

cmt'd w/250 sx

Surface Hole size 12 1/4"

Cement top @ 2600'

5 1/2" 15.5# J-55 CSG @ 5631'

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Hole Size 7 7/8" bit

Perf's:

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D3 5260' to 5267'

PBTD @ 5562' KB

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Ute Tribal #10-03

(600' FNL & 1650' FWL)

NE NW Section 10, 5S- 3W

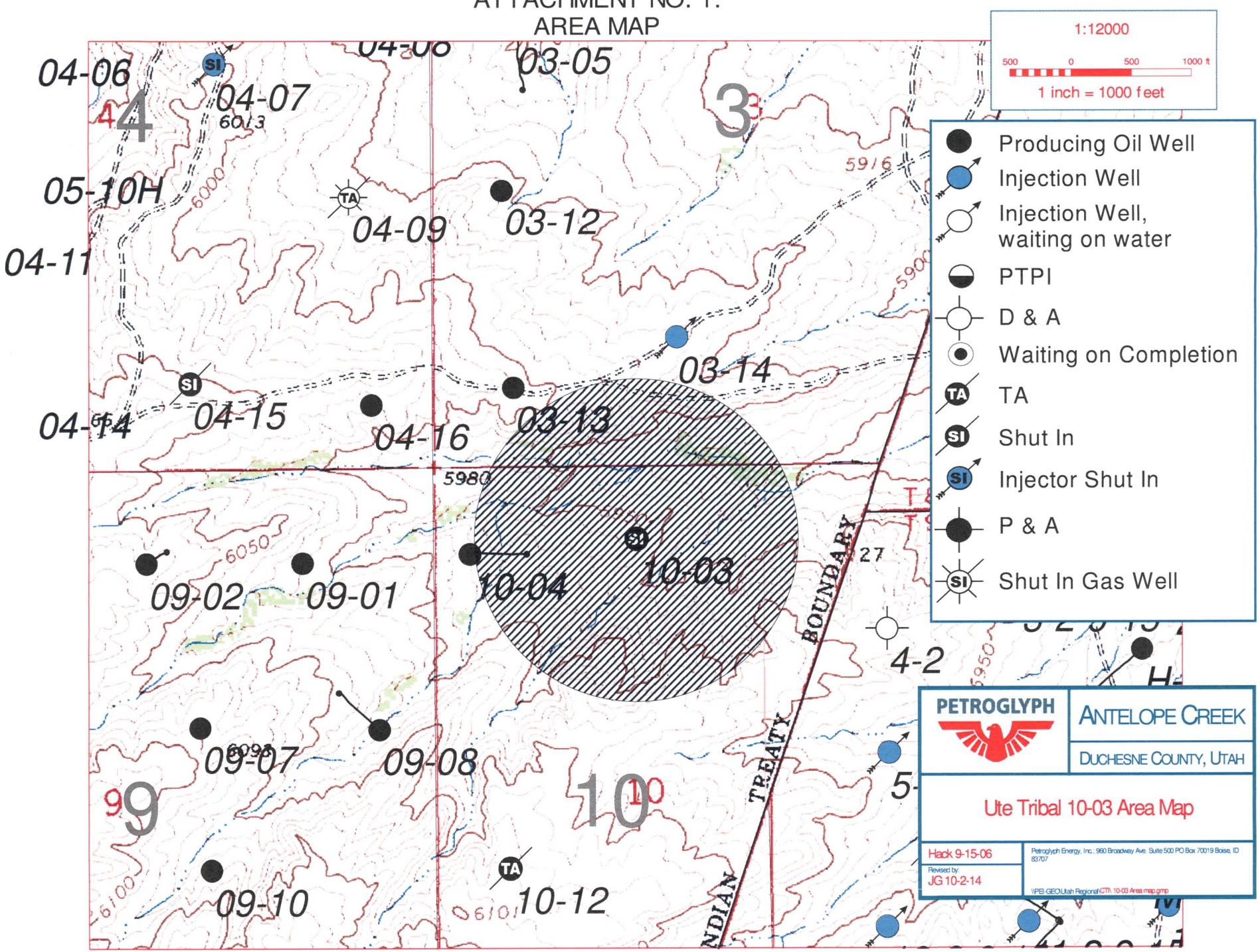
Antelope Creek Field

Duchesne Co. Utah

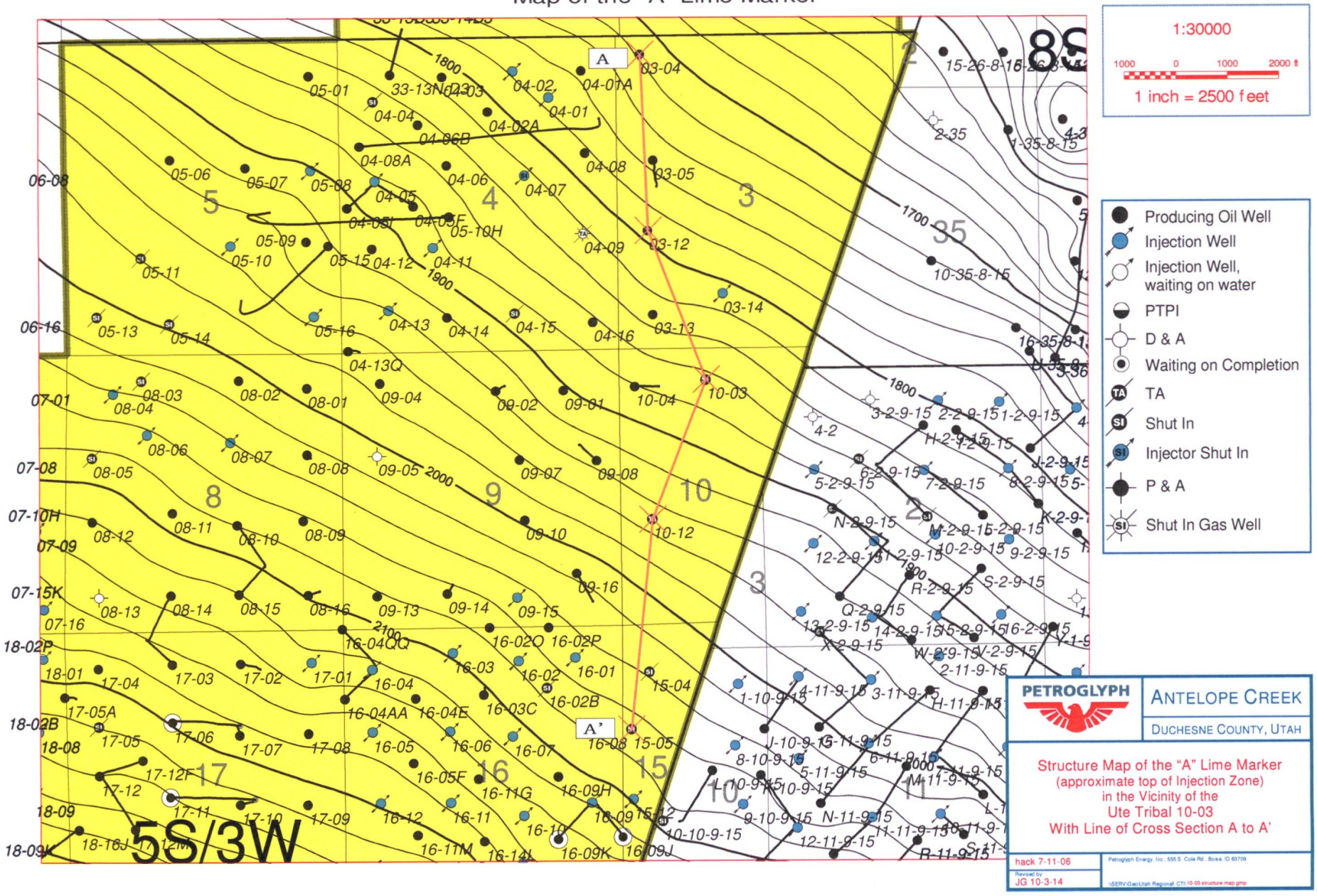
API#: 43013311870000

*Plate 1 Utah Geological Survey Special Study 144. (2012). *BMSW Elevation Contour Map, Uinta Basin, Utah.* [map]. (CA 1:200,000)

ATTACHMENT NO. 1:
AREA MAP

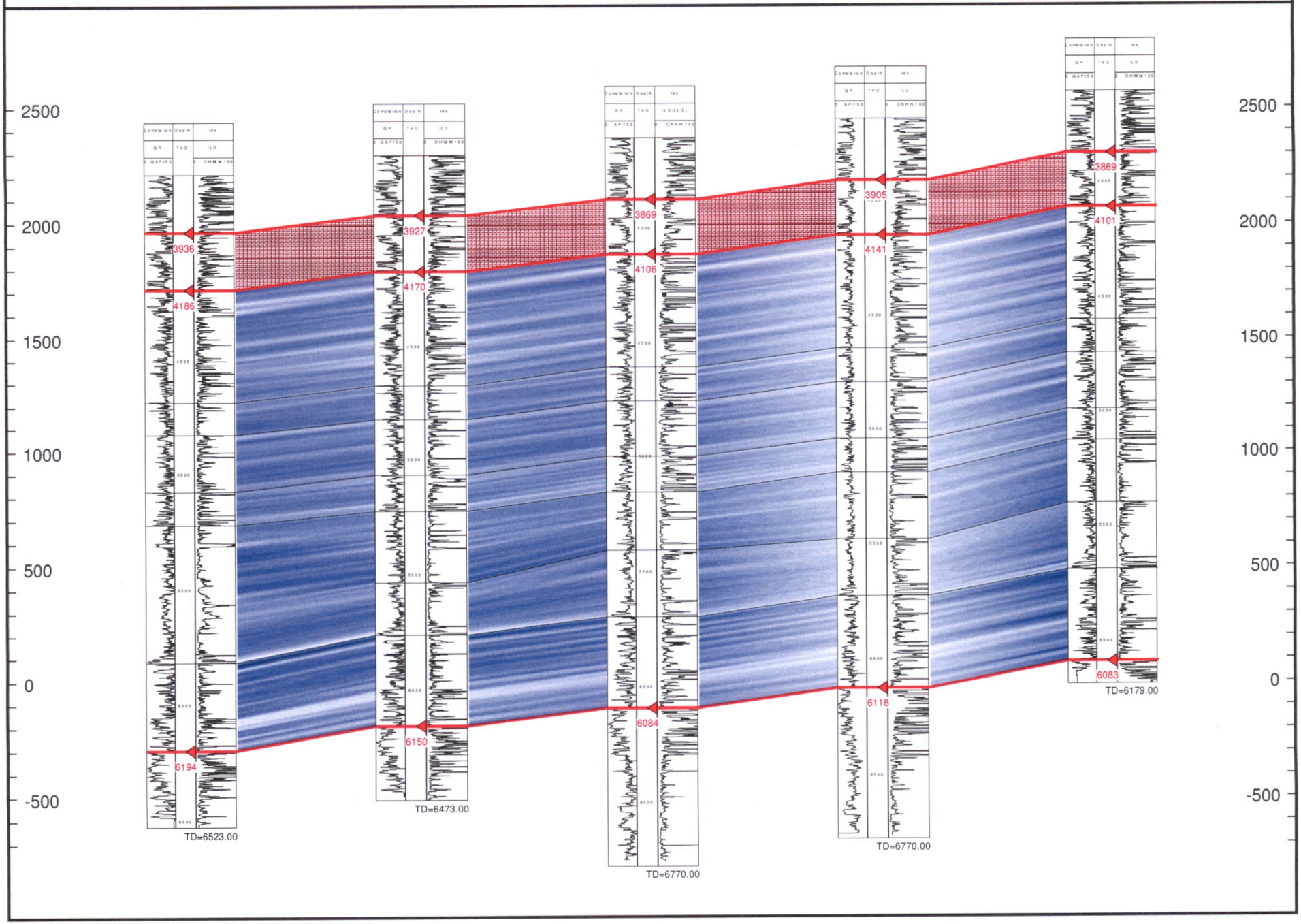


ATTACHMENT NO. 3:
Map of the "A" Lime Marker



Structural Cross Section A to A' in the Vicinity of Ute Tribal 10-03

43013317360000	3329 ft	43013317060000	3065 ft	43013311870000	2863 ft	43013308050000	4020 ft	43013318910000
PETROGLYPH OPERATING COMPANY INC Ute Tribal 03-04 360 FNL/460 FWL TWP: 5 S - Range: 3 W - Sec. 3		PETROGLYPH OPERATING COMPANY INC Ute Tribal 03-12 2272 FSL 575 FWL TWP: 5 S - Range: 3 W - Sec. 3		PETROGLYPH OPERATING COMPANY INC Ute Tribal 10-03 600 FNL 1650 FWL TWP: 5 S - Range: 3 W - Sec. 10		PETROGLYPH OPERATING COMPANY INC Ute Tribal 10-12 2001 FSL 600 FWL TWP: 5 S - Range: 3 W - Sec. 10		PETROGLYPH OPERATING COMPANY INC Ute Tribal 15-05 1979 FNL/997 FEL TWP: 5 S - Range: 3 W - Sec. 15



Maximum Allowable Injection Pressure (MAIP)
From Fracture Gradient

Date: 09/04/2015 *Operator:* **Petroglyph**

Well: **Ute Tribal 10-03**

Permit #:

Enter the following values:

Specific Gravity of injectate =	**1.010**	g/cc
Depth to top of injection interval =	**4,106**	feet
Fracture Gradient (F G) =	**0.880**	psi/ft

MAIP = **1,815** psig

(rounded down to nearest 5 psig)

where:

*MSIP = [FG - (0.433 * SG)] * Depth to top of injection interval =* *1817.603*

~~Newfield Production~~ - Technical Review Worksheet

Permit No: UT2 Well: UT 10-03

What Needs to be Done	Information Sources	Review & Evaluation Notes
Determine name, top and base of the confining zone(s) and the injection zone(s).	☐ Geologic data submitted ☐ Well logs from area ☐ Published articles	Conf Zone: top 3869 base 4106 Inj Zone: top 4106 (Garden Gulch 2-Marker) base 6084 (top Wasatch)
Determine name, top and base of all USDWs. List base of lowermost USDW: Determine which USDWs are actually being used for water supply.	☐ Geologic data submitted ☐ nearby Water analyses ☐ nearby Well logs ☐ Water supply wells ☐ Published articles	Surface Elevation: GL: 5963; KB - 5973 Pub #~~92~~ base USDW: bgs: elev: submitted base USDW bgs: 973 elev: base of Uinta / top Green River: 1454
Review and evaluate construction, casing and cementing records of proposed well. Review and evaluate construction, casing and cementing records of AOR wells that penetrate injection zone.	☐ Data submitted ☐ Completion/workover reports ☐ Contractor invoices ☐ Logs: CBL, RTS, Temp, casing inspection, etc.	TD: 6770 KB PBTD: 5562 KB surface csg 8 5/8" 24# ft 0-403' s: long strg csg 5 1/2" 15.5# ft 0-5631 s: TOC: submitted: 2600 CBL: Wells in AOR: TD TOC C 10-04 6506 Surf.
Review P&A plan for effective USDW protection, injection zone isolation and well closure.	☐ P&A plan ☐ Area geology	plug depths:
Review amount of FR - is it adequate to cover P&A costs of proposed in P&A plan?	☐ contractor bids / P&A cost histories ☐ nearby well P&A costs	FR instrument: Amount: $
Calculate the maximum allowable injection pressure (MAIP).	☐ Fracture treatments ☐ Step Rate Test results ☐ Fracture gradient	top perforation: 4253 bottom perforation: 5267 injectate specific gravity: 1.01 Frac Gradient: .88 p initial MAIP = 1815 psi
Determine which logs and tests will be performed.		